

TABLE OF CONTENTS

	<u>Page No.</u>
1. Introduction_____	1
1.1 Background_____	1
1.2 Purpose of Report _____	1
1.3 Activities for Calendar Year 2015 _____	2
1.3.1 Ongoing Activities_____	2
1.3.2 Other Activities _____	2
2. Flow Requirements and Accounts _____	2
2.1 Make-Up Water _____	2
2.2 Accounting Procedures _____	3
2.3 Hydrologic Condition _____	3
2.4 Annual Accounting for 2015 CWRMA Operations _____	5
2.5 Climatic Credits _____	10
2.6 CAP Credits _____	10
2.7 Camp Pendleton Groundwater Bank _____	11
3. Section 5(g) Monitoring Program_____	11
4. Section 7(d) Monitoring Program_____	11
5. Water Quality _____	17
5.1 Gorge_____	17
5.2 Monitoring Wells _____	17
5.3 Source Water_____	18
5.4 RCWD Production Wells _____	19
5.5 MWD Aqueduct No. 5 Discharge at Outlet WR-34_____	19
6. CWRMA Groundwater Model _____	20
7. Other Items Related to CWRMA _____	21
7.1 CASGEM Program_____	21
7.2 Sustainable Groundwater Management Act _____	22

LIST OF TABLES

	<u>Page No.</u>
1 – Definition of Terms _____	4
2 – Section 5 Minimum Daily Flow Requirements _____	6
3 – Hydrologic Conditions for Operations under CWRMA (2003 to Present) _____	7
4 – Monthly Summary of Required Flows, Discharges, Credits and Accounts (2015 Calendar Year, Below Normal Year) _____	9

LIST OF FIGURES

	<u>Page No.</u>
1 – Piezometric Head for Multiple Depth Monitoring Well, Pala Park Well _____	13
2 – Piezometric Head for Multiple Depth Monitoring Well, Wolf Valley Well _____	14
3 – Piezometric Head for Multiple Depth Monitoring Well, Temecula Creek Well _____	15
4 – Piezometric Head for Multiple Depth Monitoring Well, VDC Recharge Basin Well _____	16

APPENDICES

Appendix A	Hydrologic Condition Determination
Appendix B-1	February 12, 2016 Memorandum from Stetson Engineers, Inc.
Appendix B-2	2015 Requested Modifications for Required Minimum Daily Flows
Appendix C-1	Pala Park Groundwater Monitoring Well
Appendix C-2	Wolf Valley Groundwater Monitoring Well
Appendix C-3	Temecula Creek Groundwater Monitoring Well
Appendix C-4	VDC Recharge Basin Groundwater Monitoring Well
Appendix D-1	Water Quality Data for Imported Water Delivered to RCWD Upper VDC Recharge Basins
Appendix D-2	Water Quality Data for Vail Lake
Appendix E	Water Quality Data for Selected RCWD Production Wells
Appendix F	Water Quality Data for MWD Aqueduct No. 5 Discharge at Outlet WR-34

MAPS

Major Water Purveyors
CWRMA Location Map

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1. Introduction

1.1 Background

On August 20, 2002, the Cooperative Water Resource Management Agreement (CWRMA) between the United States, on behalf of Marine Corps Base Camp Pendleton (Camp Pendleton), and Rancho California Water District (District) was approved by the United States District Court in *United States of America v. Fallbrook Public Utility District, et al.* (Civil No. 51-cv-1247-GPC-RBB) (*Fallbrook Case*). The Court Order (Docket Nos. 4867 and 4869) incorporated CWRMA into the Judgment as adjudicated in the *Fallbrook Case*. The purpose of CWRMA is to allow Camp Pendleton and the District to effectively manage water resources consistent with prior rights and entitlements while avoiding potential conflicts. These prior rights and entitlements are derived from the *Fallbrook Case* that incorporates the stipulated judgment in *Rancho Santa Margarita v. Vail*, San Diego Superior Court Action No. 42850 (1940 Judgment). The parties agreed and the Court ordered that, to the extent the provisions of CWRMA are inconsistent with the 1940 Judgment, the provisions of CWRMA shall control for so long as CWRMA is being complied with and in effect.

The CWRMA includes provisions for guaranteed flows for the Santa Margarita River near Temecula (USGS Gaging Station No. 11044000) commonly referred to as the Gorge. Other provisions include monitoring and operation of the groundwater resources upstream of the Gorge, and monitoring of operations under CWRMA to assess impacts on water supply, water quality, and riparian habitat within Camp Pendleton. The CWRMA is administered by the Santa Margarita River Watershed Watermaster (Watermaster) appointed by the Court in the *Fallbrook Case*, in consultation with a Technical Advisory Committee (TAC). The Major Water Purveyors map at the end of this report shows the watershed boundary, major streams and reservoirs, boundaries for the major water purveyors, and other geographical features of interest. The CWRMA Location Map also included at the end of this report provides an enlargement of the primary area pertaining to CWRMA and displays key gages, groundwater monitoring wells, selected groundwater production wells, and other features for implementation of CWRMA.

1.2 Purpose of Report

Section 13 of CWRMA specifies the Watermaster shall prepare an annual report regarding the performance under the various provisions of CWRMA for filing in the *Fallbrook Case*. Prior Annual Watermaster Reports served as the annual report specified under CWRMA for submission to the Court. Beginning in Calendar Year 2011, a separate annual report has been prepared and submitted to the Court to meet the requirements of CWRMA. The Annual Watermaster Report continues to include a section dedicated to CWRMA, focusing on the accounting and operations related to Make-Up Water releases and flow requirements for the Santa Margarita River at the

Gorge. The Annual CWRMA Report is prepared by the Watermaster in consultation with the TAC and incorporates materials prepared by Camp Pendleton, the District, and the United States Geological Survey (USGS).

1.3 Activities for Calendar Year 2015

1.3.1 Ongoing Activities

Several ongoing activities are conducted in accordance with CWRMA and such activities are described and reported in subsequent sections of the Annual CWRMA Report. Ongoing activities include conducting quarterly TAC meetings, determination of hydrologic year type, operation and accounting for Make-Up Water and flow requirements at the Gorge, monitoring under the programs specified in Sections 5(g) and 7(d) of CWRMA, water quality monitoring, and actions related to the CWRMA Groundwater Model.

The TAC is chaired by the Watermaster and includes representatives of Camp Pendleton, the District, and the USGS. Quarterly TAC meetings are conducted with agenda items related to implementation of CWRMA. Minutes and other meeting materials are maintained in the Watermaster files. During 2015, regularly scheduled quarterly TAC meetings were conducted on January 20, April 21, July 21, and October 20. Additionally, a technical subgroup of the TAC conducted various workshops throughout the year in the ongoing effort to update the CWRMA Groundwater Model.

1.3.2 Other Activities

Other activities related to CWRMA are also described and reported in subsequent sections of the Annual CWRMA Report. These other activities for 2015 include implementation of the California Statewide Groundwater Elevation Monitoring (CASGEM) program and the Sustainable Groundwater Management Act (SGMA).

2. Flow Requirements and Accounts

2.1 Make-Up Water

Section 5 of CWRMA includes provisions for the District to guarantee specific flows at the Gorge. These guaranteed flows, or flow requirements, are determined based on agreed-upon methodologies and vary on a monthly basis depending upon hydrologic conditions. At a minimum, the District guarantees that flows, based on a 10-day running average, shall at no time be less than 3.0 cubic feet per second (cfs).

In order to meet the flow requirements, the District provides Make-Up Water in accordance with Section 6 of CWRMA. The Make-Up Water can be supplied from various sources; however, the District relies on two primary sources, both discharging into the river at the same location immediately upstream from the USGS gaging station at the Gorge. The first primary source of Make-Up Water is raw water from Metropolitan Water District (MWD) Aqueduct No. 5 discharged at Outlet WR-34. The second primary source of Make-Up Water is from the District's treated water distribution system through a potable connection to the pipeline for Outlet WR-34. In prior years, Make-Up Water was also discharged from the treated water distribution system to Murrieta Creek from two system discharge meters collectively referred to as the System River Meter. The two system discharge meters are located on opposite sides of Murrieta Creek immediately downstream of the USGS gaging station for Murrieta Creek at Temecula, which is located approximately 2,000 feet upstream of the confluence of Temecula Creek and Murrieta Creek. The System River Meter is operable as a secondary source of Make-Up Water if needed. Outlet WR-34 and the USGS gaging station at the Gorge are shown on the CWRMA Location Map.

2.2 Accounting Procedures

The methods of accounting for the operations under CWRMA are specified in Sections 5 and 6 of CWRMA. Specific accounting procedures have evolved since the first year of operation under CWRMA in 2003. On April 21, 2006, Camp Pendleton and the District signed an accounting agreement to memorialize methods used for years 2003, 2004, and 2005, and also to agree upon specific procedures and definitions. The accounting definitions agreed to by Camp Pendleton and the District are shown on Table 1.

A flow tracking spreadsheet has been developed through a joint effort by staff and consultants for Camp Pendleton and the District. The spreadsheet is used on a daily basis by the District to manage Make-Up Water releases and track the various accounts. The spreadsheet is updated at the end of each calendar year through a joint exchange of information to reach agreement concerning the annual operations and accounting. A copy of the final spreadsheet is provided to the Watermaster for use in preparing the Annual Watermaster Report and the Annual CWRMA Report.

2.3 Hydrologic Condition

The flow requirements and Make-Up Water releases for any particular calendar year are determined based on the hydrologic condition for the preceding October through April period. The methodology for determining the hydrologic condition is specified in Section 5 of CWRMA. A calculated hydrologic index is used to classify the hydrologic condition as one of the following hydrologic year types: Critically Dry, Below Normal, Above Normal, and Very Wet.

Table 1
Definition of Terms
Cooperative Water Resource Management Agreement

<p>Minimum Daily Flow Requirement “The <i>Minimum Daily Flow Requirement</i> for each winter period shall be 11.5 cfs, less any credit unused in a previous year, and less any credit established by the May 1st accounting of the prior year” [§5(b)]. “The <i>Minimum Daily Flow Requirement</i> is ... calculated on a 10-day running average” [§5(b)]. The winter period <i>Minimum Daily Flow Requirements</i> may be further reduced by the accrual of CAP Credits “when the District is required under this Section to provide <i>Make-Up Water</i> in any calendar year in excess of 4,000 acre-feet” [§5(e)]. For the non-winter period, the “<i>Minimum Daily Flow Requirements</i> (are) based upon the particular hydrologic condition established on May 1st for the prior October-April period” [§5(c)].</p>
<p>Actual Flow Requirement “On May 1st ..., the hydrologic condition for the immediately preceding October-April period shall be determined. Such condition, and the <i>Daily Flow Requirements</i> set forth in this Section 5(b), shall be used to determine the <i>Actual Flow Requirement</i> for the prior winter period, and whether this requirement was exceeded” [§5(b)]. “Camp Pendleton may acquire rights to such groundwater above the Gorge by foregoing its right to <i>Make-Up Water</i> from the District; or to the extent that the District’s <i>Actual Flow Maintenance Requirements</i> are less than the flows in the table in Section 5” [§17]. The <i>Actual Flow Requirement</i> is equal to the <i>Minimum Daily Flow Requirement</i> during the non-winter period (once the Hydrologic Condition is known) because no credits are applied in the non-winter period.</p>
<p>Make-Up Water “The District shall provide whatever <i>Make-Up Water</i> is needed to meet this (the <i>Minimum Daily Flow</i>) requirement” [§5(b)]. “The District shall not be required to provide more than the equivalent of 11.5 cfs <i>Make-Up Water</i> for any month”. [§5(d)] “The District guarantees that flows, based upon the 10-day running average, shall at no time be less than 3.0 cfs” [§5(f)]. “Make-Up Water ... (is) required ... at the Gorge in order to comply with the requirements of Section 5” [§6].</p>
<p>Climatic Credits are those credits earned by the District on Below Normal and Critically Dry years, when the <i>Minimum Daily Flow Requirement</i> for the winter period is found to be greater than the <i>Actual Flow Requirement</i> determined on May 1st. “In providing <i>Minimum Daily Flows</i> ... if the District has provided <i>Make-Up Water</i> in excess of its <i>Actual Requirement</i>, the District shall be entitled to a credit for such excess. The quantity of the excess flow shall be converted to a cfs equivalent, and applied during the following winter periods to reduce the 11.5 cfs requirement” [§5(b)].</p>
<p>CAP Credits are those credits earned by the District when Make-Up water is in excess of 4,000 acre-feet per year. “When the District is required under this Section to provide <i>Make-Up Water</i> in any calendar year in excess of 4,000 acre-feet, measured at the Gorge, it shall be entitled to a credit for the excess, taking into account transmission losses, to be applied during the following two winter periods” [§5(e)].</p>
<p>Actual Flow Maintenance Requirements are less than the flows in the table in Section 5. “Camp Pendleton may acquire rights to such groundwater above the Gorge by foregoing its right to <i>Make-Up Water</i> from the District; or to the extent that the District’s <i>Actual Flow Maintenance Requirements</i> are less than the flows in the table in Section 5” [§17]. “Camp Pendleton’s rights to such groundwater in storage shall not exceed 5,000 acre-feet at any one time; and ... the District’s obligation to deliver stored groundwater shall not exceed 2,200 acre-feet per year over any required makeup obligation which the District may have, and in no event at a rate in excess of 11.5 cfs” [§17].</p>
<p>Credits earned by the District serve to reduce the <i>Minimum Daily Flow Requirement</i> during the winter period. <i>Credits</i> are applied in the following order (1) Climatic Credits from 2 or more years prior, (2) Climatic Credits earned in the previous year, (3) CAP Credits earned from the previous year, and finally (4) CAP Credits from 2 years prior. “In all years following the first winter period, the same procedure shall be followed, provided that the <i>Minimum Daily Flow Requirement</i> for each winter period shall be 11.5 cfs, less any <i>credit</i> unused in a previous year, and less any <i>credit</i> established by the May 1st accounting of the prior year” [§5(a)].</p>

The hydrologic year type is determined by the TAC on May 1st of each year. The Minimum Daily Flow Requirements at the Gorge, calculated on a 10-day running average, are specified for each month based on the hydrologic year type. The Minimum Daily Flow Requirements specified under Section 5 of CWRMA are shown on Table 2.

The hydrologic condition for 2015 was determined in accordance with CWRMA procedures as reported in the May 1, 2015 memorandum prepared by Stetson Engineers, Inc. (consultant to Camp Pendleton), provided in Appendix A. The Temecula Creek near Aguanga streamflow gage (USGS Gaging Station No. 11042400) and the Wildomar precipitation gage (Riverside County Flood Control and Water Conservation District Precipitation Station No. 246) are the key sources of data used for the determination and are shown on the CWRMA Location Map.

The determination for 2015 resulted in the classification of the hydrologic condition as a Below Normal hydrologic year and thus the Minimum Daily Flow Requirements for 2015 are shown in Table 2 under the column heading for Below Normal hydrologic year. The determinations of the hydrologic conditions for the years 2003 through 2015 are summarized on Table 3.

2.4 Annual Accounting for 2015 CWRMA Operations

The annual accounting for CWRMA operations is prepared through a joint effort by Camp Pendleton and the District. The flow tracking spreadsheet maintained on a daily basis by the District is provided to Camp Pendleton for review and use in preparing the annual accounting. The version of the spreadsheet used for the 2015 Annual CWRMA Report is Version No. 4.5, updated February 12, 2016.

The annual accounting for the 2015 CWRMA operations is documented in the February 12, 2016 memorandum prepared by Stetson Engineers, Inc., as provided in Appendix B-1. The memorandum provides a description of the operations during 2015, including tables showing the daily flows at the Gorge, Minimum Daily Flow Requirements, Make-Up Water releases, and account balances.

Upon agreement by Camp Pendleton and the District, CWRMA includes provisions for the parties to alter normal operations to modify the Minimum Daily Flow Requirements at the Gorge. Examples of modifying the Minimum Daily Flow Requirements include instances when the parties are conducting sampling for downstream monitoring programs or requests to avoid

Table 2
Section 5 Minimum Daily Flow Requirements
Cooperative Water Resource Management Agreement

	Critically Dry	Below Normal	Above Normal	Very Wet
Month	cfs	cfs	cfs	cfs
Jan - April	4.5	8.0	17.8 *	24.1 *
May	3.8	5.7	11.7 *	15.7 *
June	3.3	4.9	9.4	12.2 *
July	3.0	4.3	7.8	9.7
August	3.0	4.4	7.6	9.2
September	3.0	4.1	7.4	9.4
October	3.0	3.9	7.7	10.1
November	3.0	4.5	8.8	11.5
December	3.3	5.3	10.4	13.5 *

* Section 5(d) of CWRMA specifies the District shall not be required to provide more than the equivalent of 11.5 cfs Make-Up Water for any month.

Table 3
Hydrologic Conditions for Operations under CWRMA
(2003 to Present)

Calendar Year	Hydrologic Condition
2003	Above Normal
2004	Critically Dry
2005	Very Wet
2006	Below Normal
2007	Critically Dry
2008	Above Normal
2009	Above Normal
2010	Very Wet
2011	Very Wet
2012	Critically Dry
2013	Critically Dry
2014	Below Normal
2015	Below Normal

accumulation of CAP Credits. Such modifications of CWRMA operations are accomplished through communications between, and approval by, the parties and are presented in Appendix B-2. No modifications for Required Minimum Daily Flows were requested by the parties during Calendar Year 2015.

One item of note concerns the USGS measured flows at the Gorge that are used for the daily determinations by the District for discharging Make-Up Water. Two columns of daily discharges for streamflow at the Gorge are shown in the tables in Appendix B-1: the USGS official discharge and the USGS website discharge. Camp Pendleton and the District have agreed that the discharges shown on the website are accessed daily by the District for making daily decisions regarding the quantities of Make-Up Water required and those discharges are used to compute the 10-day running average. The website discharge is considered to be provisional subject to subsequent changes by the USGS until such time as the data are designated as approved for official publication. The USGS may make changes to the provisional data multiple times prior to this designation that may result in official discharge values being materially different than provisional values, depending upon the nature of any specific adjustments. Such adjustments may be due to periodic measurements at the gage resulting in a shift to the rating curve or other changes to the data to account for equipment malfunctions and other irregularities.

It is also noted the daily tables provided in Appendix B-1 show the Minimum Daily Flow Requirement for each month as determined by the hydrologic condition and any adjustments agreed upon by the parties. The winter period includes the months January through April, and in accordance with Section 5(e) of CWRMA, the Minimum Daily Flow Requirement “... shall be 11.5 cfs less any credit unused in a previous year, and less any credit established by the May 1st accounting of the prior year.” The Minimum Daily Flow Requirement for the 2015 winter period was determined to be 8.3 cfs (11.5 – 3.2), as documented in the annual accounting for the 2014 CWRMA operations (February 27, 2015 memorandum prepared by Stetson Engineers, Inc.).

A summary of the annual accounting for the 2015 CWRMA operations is shown on Table 4. During Calendar Year 2015, the total releases by the District to meet CWRMA flow requirements were 3,736.4 acre feet. In Calendar Year 2015, the releases were comprised of 3,244.4 acre feet of raw water from Outlet WR-34 and 492.0 acre feet from the potable connection at Outlet WR-34 during a MWD raw water shut down in February and March 2015.

The number of days each month when the 10-day running average was less than the required flow is summarized on Table 4. It is noted the number of days when the 10-day running average is less than the required flow is determined based upon the provisional website discharge, as agreed upon by the parties. For Calendar Year 2015, there were no days when the 10-day running average was less than the required flow under normal CWRMA operations.

Table 4

**Monthly Summary of Required Flows, Discharges, Credits and Accounts
Cooperative Water Resource Management Agreement**

2015 Calendar Year - Below Normal Year

Month	USGS		Minimum Flow Maintenance Requirement cfs 1/	Section 5 Flows cfs 2/	No. of Days 10-Day Running Average is Less Than Required Flow	Discharge from WR-34 AF 3/	Climatic Credits Earned AF 4/	Camp Pendleton	
	USGS Official Discharge AF	USGS Website Daily Discharge AF						Groundwater Bank Input AF	5/ Cumulative Balance AF
January	620.4	639.5	8.3	8.0	0	439.0	161.5	195.3	5,000.0
February	488.3	492.1	8.3	8.0	0	370.4	105.8	176.4	5,000.0
March	636.1	619.2	8.3	8.0	0	437.6	169.1	195.3	5,000.0
April	493.9	494.1	8.3	8.0	0	414.3	126.3	189.0	5,000.0
May	669.2	668.8	5.7	5.7	0	286.0	0.0	0.0	5,000.0
June	314.8	300.3	4.9	4.9	0	282.5	0.0	0.0	5,000.0
July	328.3	320.7	4.3	4.3	0	215.8	0.0	0.0	5,000.0
August	269.8	270.7	4.4	4.4	0	252.3	0.0	0.0	5,000.0
September	249.7	249.7	4.1	4.1	0	217.6	0.0	0.0	5,000.0
October	246.3	248.3	3.9	3.9	0	233.0	0.0	0.0	5,000.0
November	268.0	268.0	4.5	4.5	0	257.3	0.0	0.0	5,000.0
December	324.7	325.7	5.3	5.3	0	330.6	0.0	0.0	5,000.0
TOTAL	4,909.5	4,897.1			0	3,736.4	562.7	756.0	FULL

1/ Required flows for January through April are equal to 11.5 cfs less 3.2 cfs of credits (749 AF of Climatic Credit earned in 2014 and 4.5 AF CAP Credit earned in 2014).

2/ The Table in Section 5 of the CWRMA sets forth guaranteed monthly flows at the Gorge once the Hydrologic Condition for the calendar year is established.

3/ CAP Credits equal the WR-34 discharge in excess of 4,000 AF. No CAP Credits were earned in 2015.

4/ Climatic Credits equal the WR-34 discharges less actual Flow Requirements, which is the flow indicated in Section 5 of the CWRMA less applicable credits but not less than 3.0 cfs.

5/ Camp Pendleton's rights to groundwater equal the flow indicated in Section 5 of the CWRMA less the Actual Flow Maintenance Requirement, which cannot be less than 3.0 cfs. Input to the Groundwater Bank shown but cumulative balance did not increase due to account balance maximum of 5,000 AF.

The Minimum Daily Flow Requirement for the 2016 winter period is determined as part of the annual accounting for the 2015 CWRMA operations. As described on Page 1, Appendix B-1, the Minimum Daily Flow Requirement at the Gorge during the 2016 winter period is determined to be 9.1 cfs (11.5 – 2.37).

2.5 Climatic Credits

Section 5(d) of CWRMA includes a provision for comparing the winter period Minimum Daily Flow Requirements with the Actual Flow Requirements based on the hydrologic conditions determined on May 1st. For Below Normal and Critically Dry years, if the Minimum Daily Flow Requirement is determined to be greater than the Actual Flow Requirements, the District is entitled to a Climatic Credit for such excess.

Beginning in January of each year, the District provides Make-Up Water to meet the Minimum Daily Flow Requirement of 11.5 cfs (less any applied credits) during the winter period January through April, based upon the 10-day running average. On May 1st, if the hydrologic determination results in a year type of Below Normal or Critically Dry, the Actual Flow Requirement, in retrospect, would be less than 11.5 cfs, as shown in Table 2. The District would be entitled to Climatic Credits for any excess releases in those year types. In Above Normal and Very Wet years, the winter period flow requirements are equal to 11.5 cfs and thus Climatic Credits cannot be earned.

The Climatic Credits are determined on a volumetric basis as the accumulation of the difference of the daily Outlet WR-34 Make-Up Water discharge, less the Actual Daily Flow Requirement, less any applied credits from the prior year. Climatic Credits earned in a particular year are converted to a cfs equivalent and applied during the following winter periods to reduce the 11.5 cfs requirement in accordance with the order of applying credits shown on Table 1.

As shown on Table 4, Climatic Credits were earned by the District in 2015 in the amount of 562.7 acre feet. A summary of the Climatic Credits earned and applied for the period 2003 to present is included in Appendix B-1.

2.6 CAP Credits

CAP Credits are credits earned by the District when Make-Up Water is in excess of 4,000 acre feet per year as specified in Section 5(e) of CWRMA. Any CAP Credits earned in a particular year are applied during the following two winter periods to reduce the 11.5 cfs requirement. As described in Appendix B-1, no CAP Credits were earned by the District in 2015. A summary of the CAP Credits earned and applied for the period 2003 to present is included in Appendix B-1.

2.7 Camp Pendleton Groundwater Bank

Section 17 of CWRMA provides for emergency supplies for Camp Pendleton, including the establishment of rights to the use of groundwater in the basin upstream of the Gorge. Such rights are established by Camp Pendleton foregoing its rights to Make-Up Water, or to the extent that the District's Actual Flow Requirements are less than the flows specified on Table 2. The cumulative balance in the Camp Pendleton Groundwater Bank may not exceed 5,000 acre feet.

Table 4 shows the input or accrual to the Camp Pendleton Groundwater Bank in 2015 as 756.0 acre feet earned through determining the difference between actual and required flow requirements during the winter period. The groundwater input is shown on Table 4 but is not credited to the account due to the account balance maximum of 5,000 acre feet.

A summary of the Camp Pendleton Groundwater Bank credits earned and used for the period 2003 to present is included in Appendix B-1. The maximum account balance of 5,000 acre feet was reached in 2005, and has been maintained since that time. Camp Pendleton has not used any water from the Camp Pendleton Groundwater Bank to date.

3. Section 5(g) Monitoring Program

Section 5(g) of CWRMA provides for a program to assess the impacts of CWRMA operations on water supply, water quality and riparian habitat within Camp Pendleton. During 2007-08, Camp Pendleton initiated the Section 5(g) program named as the Lower Santa Margarita River Watershed Monitoring Program (Program) to evaluate whether the increased flows under CWRMA impacted threatened and endangered species, riparian and wetland habitats, or water quality downstream. The Program will also support other water quality monitoring and watershed management activities in the Santa Margarita River Watershed. A copy of the Statement of Work for the Lower Santa Margarita River Watershed Monitoring Program was previously published in the 2007 and 2008 Annual Watermaster Reports. The monitoring was funded for a two-year period and the final report, *Hydrological and Biological Support to Lower Santa Margarita River Watershed Monitoring Program Water Years 2008-2009*, was published on February 21, 2010, by the United States Bureau of Reclamation, Southern California Office, under a cooperative agreement with Camp Pendleton and is available at the following website:

<http://www.usbr.gov/lc/socal/reports/SMMonitoringFinalReport.pdf>.

4. Section 7(d) Monitoring Program

Section 7(d) of CWRMA provides for a program to assess safe yield operations of the District for pumping groundwater from the basin upstream of the Gorge through the use of a multi-level groundwater monitoring network and periodic updates of the CWRMA

Groundwater Model. In September 2006, the USGS, under contract with Camp Pendleton and the District, constructed a multi-level monitoring well for the Murrieta-Temecula Groundwater Basin in accordance with Section 7(d) of CWRMA. The USGS monitoring program for the Pala Park Groundwater Monitoring Well (TMPP) is included in the ongoing Watermaster budget beginning in year 2007-08. The Pala Park Groundwater Monitoring Well is located near the confluence of Pechanga and Temecula creeks as shown on the CWRMA Location Map and was completed to a total depth of 1,499 feet. Six piezometers were installed for continuous water level recording in the saturated zone for the lower five screened intervals and a temperature probe for the upper-most screened interval to detect moisture in the unsaturated zone. In 2009, water level recording equipment was added for the upper-most piezometer. The piezometric head for the six piezometers for the Pala Park Groundwater Monitoring Well for the period December 27, 2006 through December 31, 2015, is shown on Figure 1.

In 2009, the groundwater monitoring program was expanded to include the Wolf Valley Groundwater Monitoring Well (TMWV) that was previously constructed under a cooperative agreement between the USGS and the Pechanga Band of Luiseño Mission Indians. The Wolf Valley Groundwater Monitoring Well is located off the Pechanga Indian Reservation as shown on the CWRMA Location Map. Two piezometers are installed at the Wolf Valley Groundwater Monitoring Well. The groundwater level monitoring for the Wolf Valley Groundwater Monitoring Well was previously funded by the Pechanga Band, but is now included in the ongoing Watermaster budget beginning in year 2009-10. The piezometric head for the two piezometers for the Wolf Valley Groundwater Monitoring Well for the period March 5, 1990 through December 31, 2015, is shown on Figure 2.

In 2013, two additional groundwater monitoring wells were constructed by the USGS under contract with the District. The groundwater level monitoring for these additional wells is included in the ongoing Watermaster budget. The two additional wells are shown on the CWRMA Location Map as the Temecula Creek Groundwater Monitoring Well (TMTC) and the VDC Recharge Basin Groundwater Monitoring Well (TMVC). In April 2013, the Temecula Creek Groundwater Monitoring Well was drilled to a depth of 1,720 feet, and was completed with five piezometers. The piezometric head for the five piezometers for the Temecula Creek Groundwater Monitoring Well for the period September 28, 2013 through December 31, 2015, is shown on Figure 3. In August 2013, the VDC Recharge Basin Groundwater Monitoring Well was drilled to a depth of 1,033 feet, and was completed with six piezometers. The piezometric head for the four active piezometers for the VDC Recharge Basin Groundwater Monitoring Well for the period April 24, 2014 through December 31, 2015, is shown on Figure 4.

Figure 1
Piezometric Head for Multiple Depth Monitoring Well
Pala Park Well (8S/2W-19A1-6)
December 27, 2006 through December 31, 2015

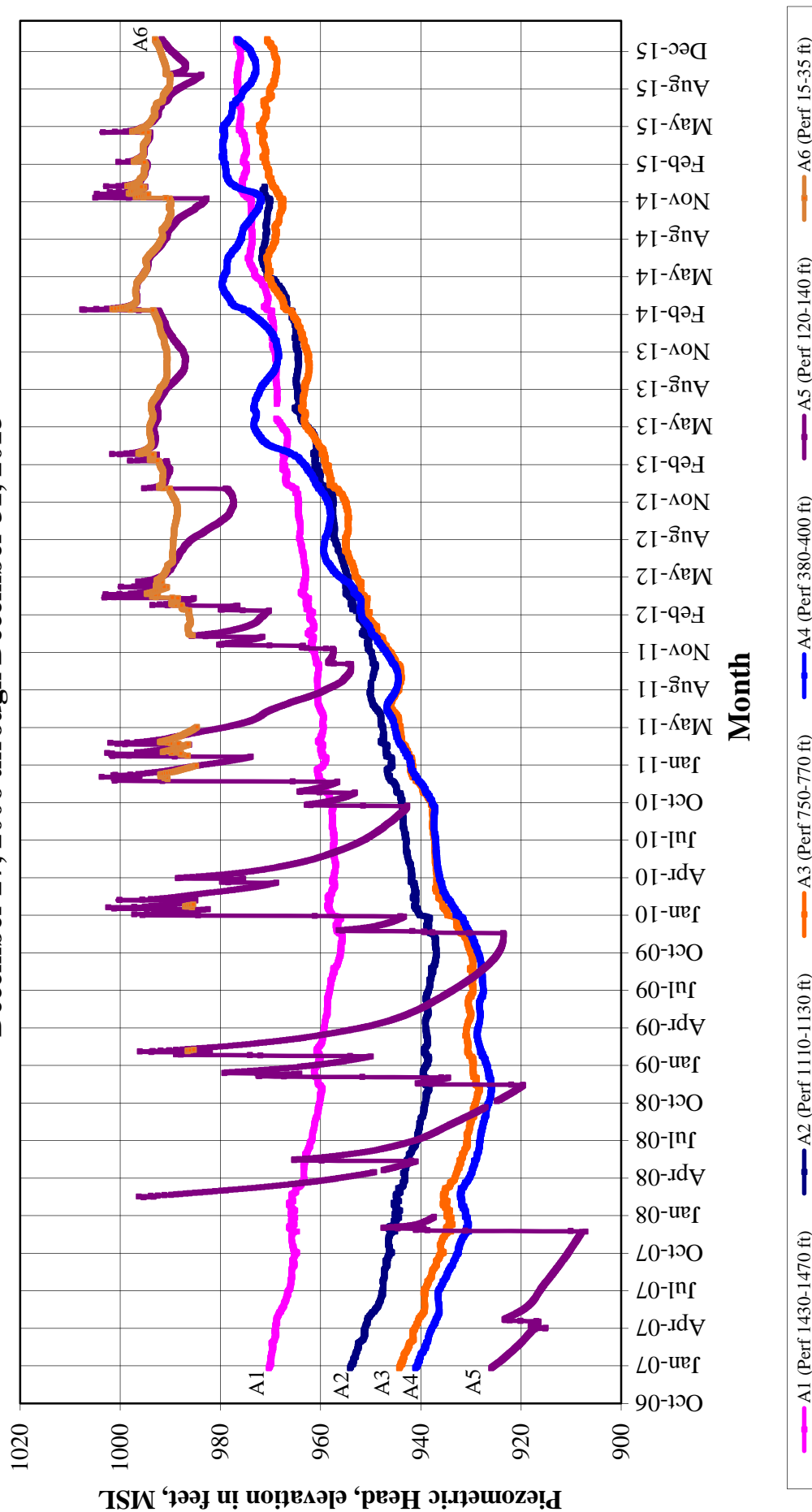


Figure 2
Piezometric Head for Multiple Depth Monitoring Well
Wolf Valley Well (8S/2W-20J1-2)
March 5, 1990 through December 31, 2015

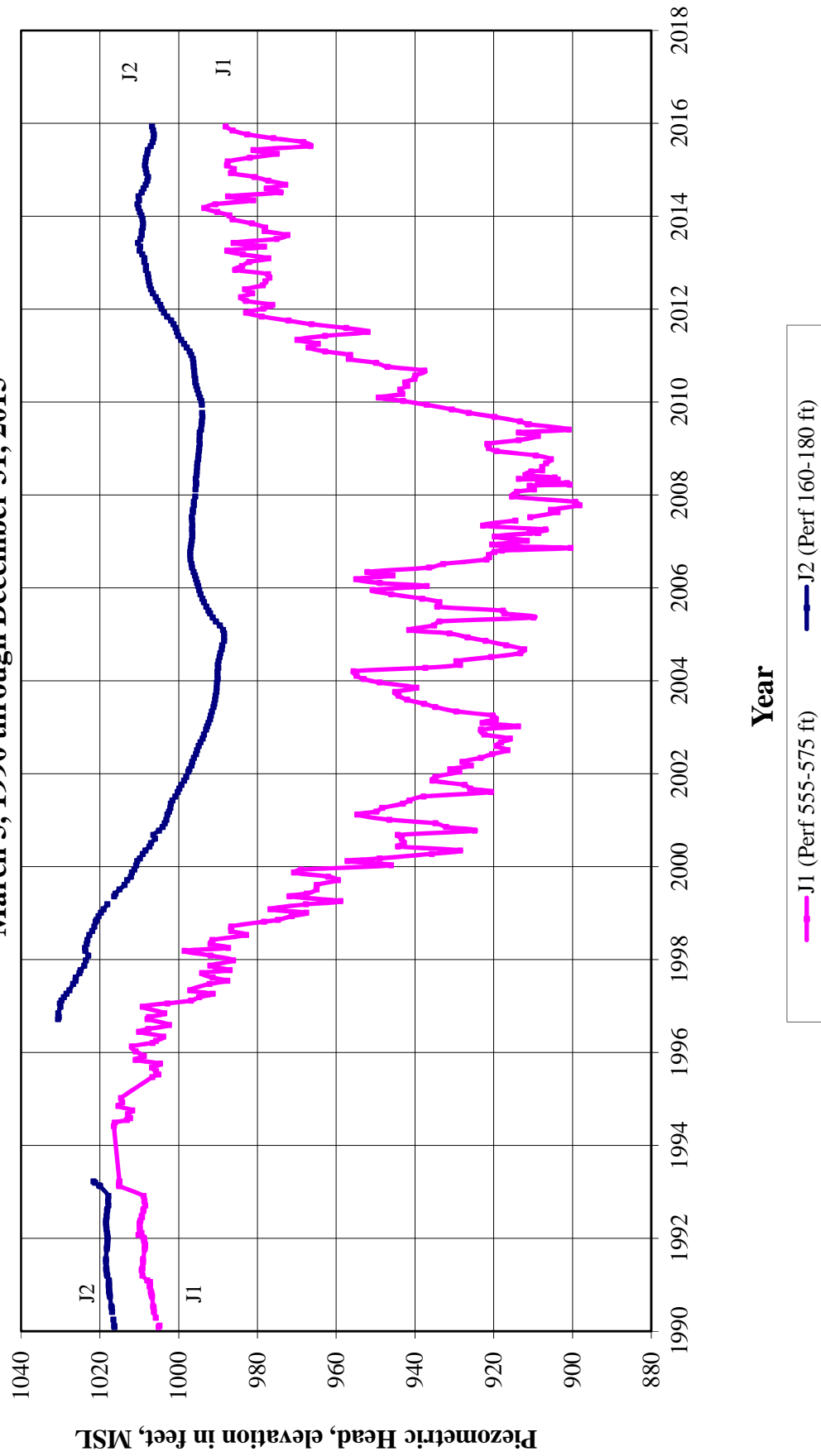


Figure 3
Piezometric Head for Multiple Depth Monitoring Well
Temecula Creek Well (8S/2W-15F1-5)
September 28, 2013 through December 31, 2015

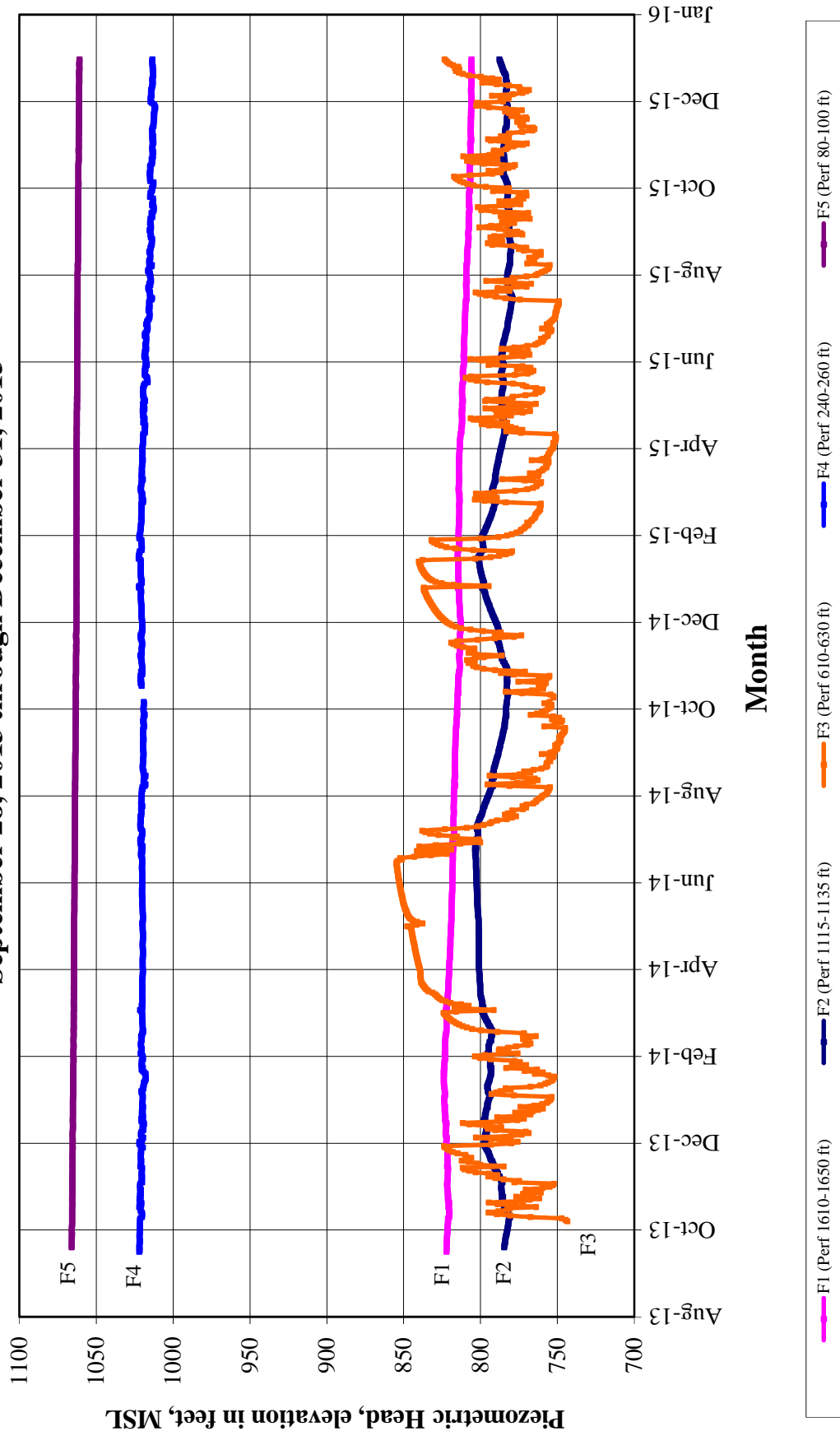
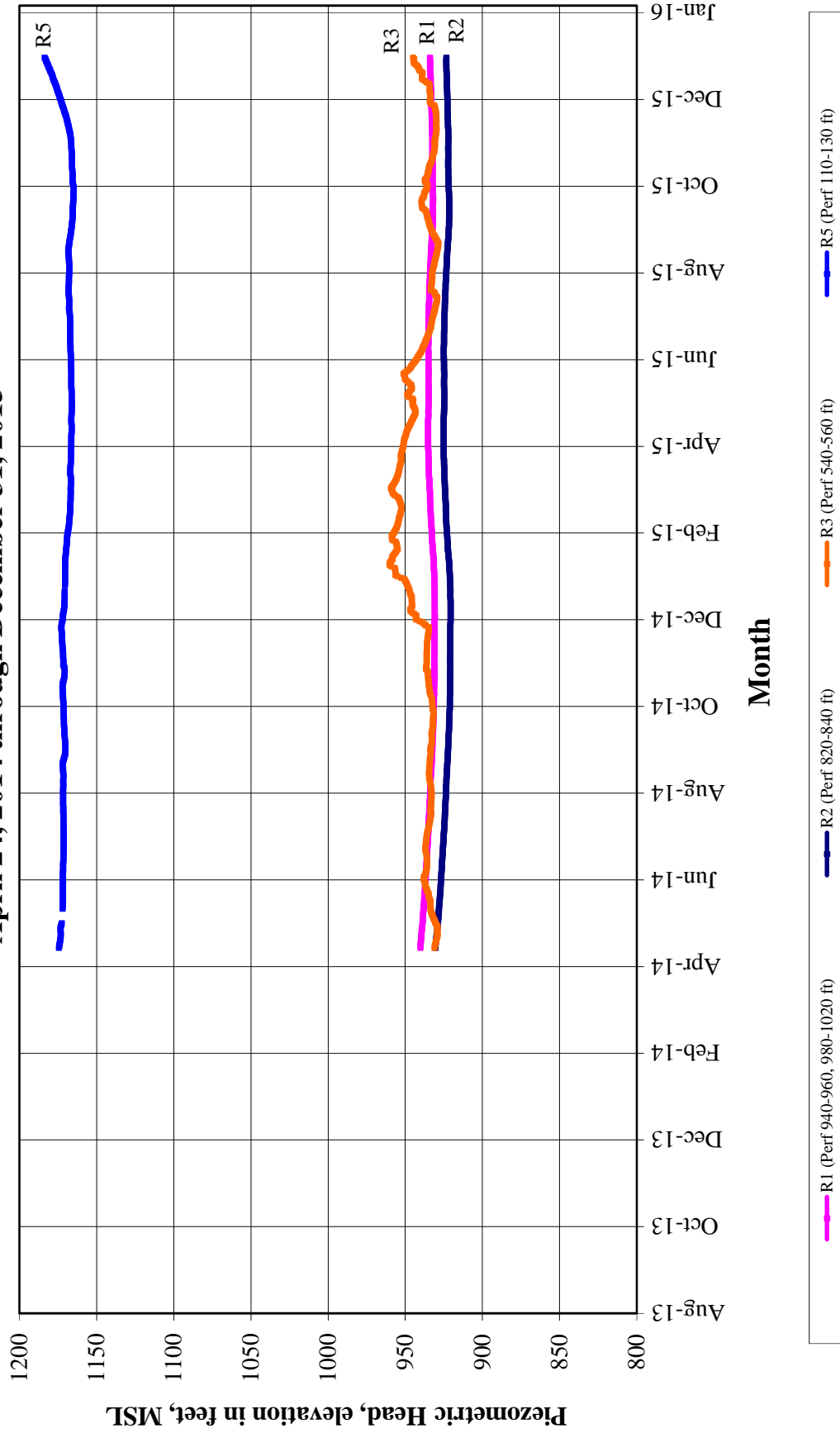


Figure 4
Piezometric Head for Multiple Depth Monitoring Well
VDC Recharge Basin Well (8S/1W-6R1-6)
April 24, 2014 through December 31, 2015



Information concerning the construction of the Pala Park, Wolf Valley, Temecula Creek, and VDC Recharge Basin groundwater monitoring wells, groundwater levels, and water quality data can be found at the following website: <http://ca.water.usgs.gov/temecula/>. Information obtained from the website, and supplemental information for the Pala Park Groundwater Monitoring Well, are provided in Appendix C-1. The information for the Wolf Valley Groundwater Monitoring Well is provided in Appendix C-2. Information for the Temecula Creek and VDC Recharge Basin monitoring wells is provided in Appendix C-3 and Appendix C-4, respectively.

5. Water Quality

5.1 Gorge

Section 10 of CWRMA specifies that the Watermaster shall monitor water quality at the Gorge. The Watermaster budget includes funding for the USGS to continuously monitor four water quality parameters at the Santa Margarita River near Temecula gaging station: dissolved oxygen, pH, specific conductance, and temperature. The annual water quality data are reported in the Annual Watermaster Report and data for the period of record can be accessed at the website: http://waterdata.usgs.gov/ca/nwis/uv/?site_no=11044000&agency_cd=USGS&.

5.2 Monitoring Wells

Groundwater quality data are collected as part of the Section 7(d) Monitoring Program. Data are collected by the USGS with funding through the Watermaster budget. The data can also be accessed at the following website: <http://ca.water.usgs.gov/temecula/>.

Water quality data collected to date for the Pala Park Groundwater Monitoring Well are included in Appendix C-1. Water quality data have been collected in one or more of the piezometers since 2006. Analyses and piezometers included in the particular annual regimen vary to maximize utility of the annual funding levels. Also included in Appendix C-1 are tri-linear and stable isotope diagrams produced by the USGS.

Water quality data for the Wolf Valley Groundwater Monitoring Well are included in Appendix C-2. The water quality data include samples collected in 1990 and 1993, under the prior cooperative agreement between the USGS and the Pechanga Band. Data for 2009 and 2010 were collected with funding as part of the Watermaster budget. Tri-linear and stable isotope diagrams produced by the USGS are included in Appendix C-2.

Water quality data for the Temecula Creek Groundwater Monitoring Well are included in Appendix C-3. The water quality data include samples collected in 2013 and 2014. The samples collected in 2013 were included as part of construction of the well. Data for 2014

were collected with funding as part of the Watermaster budget. Tri-linear and stable isotope diagrams produced by the USGS are included in Appendix C-3.

Water quality data for the VDC Recharge Basin Groundwater Monitoring Well are included in Appendix C-4. The water quality data include samples collected in 2013 and 2014. The samples collected in 2013 were included as part of construction of the well. Data for 2014 were collected with funding as part of the Watermaster budget. Tri-linear and stable isotope diagrams produced by the USGS are included in Appendix C-4.

5.3 Source Water

In 2010, 2011, and 2012, the water quality monitoring program also included collecting data for the two sources of supply for recharge at the head of Pauba Valley: (1) imported supplies for recharge at the District's groundwater recharge facilities, and (2) native supplies from Temecula Creek as sampled at Vail Lake. Funding from the Watermaster budget was used to collect and analyze the data.

The District operates groundwater recharge facilities at the head of Pauba Valley for the recharge of imported and native water supplies. Water quality data for the District's Upper VDC Recharge Basin Pond No. 5 are provided in Appendix D-1. The water quality data include a sample collected in 2007, as part of a cooperative effort between the USGS and the District. Data for 2010 through 2012 were collected with funding through the Watermaster budget. It is interesting to note the percentage of State Water Project (SWP) water in the imported supplies compared to the percentage of Colorado River water. The percentage of SWP water for the 2007, 2010, 2011, and 2012 samples is estimated as 28, 19, 63, and 51 percent, respectively. Several parameters, including hardness, calcium, sodium, and chloride, show a marked difference in 2011 and 2012, compared to samples collected in 2007 and 2010.

In 2009, the District initiated a water quality sampling program at Vail Lake in part to characterize the water quality for recharge from native supplies at the head of Pauba Valley. It is of interest to characterize the Vail Lake native water prior to the planned future storage of imported supplies in Vail Lake. The water quality sampling locations for Vail Lake and water quality data collected at Vail Lake Station No. 3 for the period September 22, 2009 through October 31, 2015 are provided in Appendix D-2. The Vail Lake sampling program was suspended from June 22, 2013 until October 31, 2015. The sampling event on October 31, 2015 was the only sampling for 2015. Samples are collected at two depths with sample numbering reflecting the sample depths: 3 Vail 1M denotes sampling Station No. 3 at a depth of one meter below water surface and 3 Vail 1MAB denotes sampling Station No. 3 at a depth of one meter above the bottom of the lake. In 2011, water quality sampling from Station No. 3 was added to the program funded by the Watermaster in order to obtain sample

analyses comparable to sampling programs for the VDC Recharge Basin Pond No. 5 and the Pala Park and Wolf Valley groundwater monitoring wells. The water quality data collected in 2011 and 2012, by the USGS under the Watermaster program, are also shown in Appendix D-2.

Combined tri-linear and stable isotope diagrams for VDC Pond No. 5 and Vail Lake are repeated in both Appendices D-1 and D-2 with the parameters showing clear differences between the two sources of supply.

5.4 RCWD Production Wells

In 2012, the water quality monitoring program also included collecting data from selected groundwater production wells operated by the District within Pauba Valley as shown on the CWRMA Location Map. These wells were selected to compliment the water quality data for the monitoring wells and the two sources of supply for recharge at the head of Pauba Valley as described in the preceding section. Previously, groundwater production wells operated by the District were included in the Groundwater Ambient Monitoring and Assessment (GAMA) program implemented by the California State Water Resources Control Board.

Water quality data for the selected production wells are included in Appendix E. Data reported for 2004 and 2007 were collected as part of the GAMA program. Data reported for 2012 were collected with funding from the Watermaster budget. Tri-linear and stable isotope diagrams produced by the USGS are included in Appendix E. The stable isotope diagrams are segregated by wells considered to be completed in the Pauba Aquifer and the Temecula Aquifer.

In 2013, the TAC and Watermaster Steering Committee approved using funding from the Watermaster budget to analyze archived, age-dating samples that were collected during 2012. The samples from two RCWD production wells, Well Nos. 109 and 234, were analyzed in 2014 for tritium and carbon isotopes. The water quality data tabulation for 2012 shown in Appendix E has been updated to include the age-dating results for Well Nos. 109 and 234.

5.5 MWD Aqueduct No. 5 Discharge at Outlet WR-34

In 2012, the District's water quality sampling program was expanded to include sampling at the MWD Aqueduct No. 5 Discharge at Outlet WR-34. The water quality data for Outlet WR-34 for the period May 30, 2012 through December 11, 2015, are included in Appendix F. The data include inorganic, organic, and physical parameters comparable to the data collected at Vail Lake and the RCWD Production Wells.

In addition, the District is monitoring the presence or absence of Quagga mussels at a location in the Santa Margarita River approximately 100 feet downstream of the discharge point for Outlet WR-34. The monitoring utilizes coupon sampling equipment and protocol established under the Rancho California Water District Dreissena Mussel Response and Control Action Plan approved by the California Department of Fish and Wildlife. To date, there have been no Quagga mussels detected in the Santa Margarita River.

6. CWRMA Groundwater Model

Section 7 of CWRMA provides for the District to operate the groundwater basin upstream of the Gorge on a safe-yield basis. As indicated above, Section 7(d) of CWRMA specifies that the District and Camp Pendleton will develop and utilize a monitoring program and the CWRMA Groundwater Model to assess safe-yield operations. The CWRMA Groundwater Model was developed by the TAC as part of the negotiations between the District and Camp Pendleton that resulted in the final CWRMA and is jointly owned by the two parties. The CWRMA Groundwater Model was developed over the period 1995 through early 2003, with the final model documentation report prepared on January 31, 2003. The computer code used for the CWRMA Groundwater Model is MODFLOW, which is a three-dimensional finite difference groundwater flow model developed and maintained by the USGS. The CWRMA Groundwater Model extends throughout the Murrieta-Temecula Groundwater Basin, which is the groundwater basin upstream of the Gorge and is defined in pertinent interlocutory judgments and exhibits as adjudicated in the *Fallbrook Case*.

The CWRMA Groundwater Model is used for assessing safe-yield operations pursuant to Section 7(d) and is also used by the District on an ongoing basis as a management tool to assess groundwater pumping impacts and to set annual pumping amounts for managing the groundwater basin. Section 7(d) of CWRMA specifies that the CWRMA Groundwater Model shall be updated periodically, and in no event less frequently than every five years.

Accordingly, in 2007, Camp Pendleton and the District initiated an effort to update the CWRMA Groundwater Model. Work on updating the groundwater model was completed in 2014 and 2015 with publication of the April 25, 2014 (revised January 8, 2015) report prepared by GEOSCIENCE Support Services, Inc., entitled *Surface and Ground Water Model of the Murrieta-Temecula Ground Water Basin, California, Model Update and Refinement Report*. The model update included the following: (1) development of GSFLOW which is a coupled surface water and groundwater model that includes a Precipitation-Runoff Modeling System (PRMS) and MODFLOW, (2) refinement of the groundwater model cell size, active/inactive boundaries and locations of recharge and discharge, (3) development of a three-dimensional lithologic model based on lithologic and geophysical borehole logs from wells in the area, (4) refinement of groundwater model layer elevations based on the results from the lithologic model, and (5) update of the surface water and groundwater model with data through 2008.

In 2015, Camp Pendleton and the District initiated further efforts to update the CWRMA Groundwater Model and to conduct groundwater model runs to evaluate various aspects of the management of the Murrieta-Temecula Groundwater Basin. The further model updates will include the following: (1) update the model with the most recent version of GSFLOW, (2) augment the model with solute transport model capability, (3) extend the model with updated hydrogeologic data for the period from January 2009 through September 2014, (4) update water application rates and return flow factors and distributions, and (5) re-calibrate the model. The anticipated groundwater management model runs include evaluation of groundwater storage calculations, return flow factors, and credit accounts used by the Watermaster for accounting and reporting practices for Vail Lake and groundwater operations. The anticipated model runs will also include an evaluation of the safe yield of the groundwater basin.

7. Other Items Related to CWRMA

Other items of note for 2015 related to CWRMA include the continued implementation of the State of California groundwater elevation monitoring program for the groundwater basin upstream of the Gorge and the California Sustainable Groundwater Management Act. These items are included in the Annual CWRMA Report for informational purposes.

7.1 CASGEM Program

On November 6, 2009, the Governor for the State of California approved Senate Bill SBX7 6 Groundwater Elevation Monitoring (SBX7 6). SBX7 6 provides for a statewide program of reporting groundwater elevation data for groundwater basins and is implemented by the California Department of Water Resources (DWR). The program is referred to as the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. The Bill defines “basins” or “sub-basins” to mean a groundwater basin or sub-basin identified and defined in DWR Bulletin No. 118. Three such basins (plus a portion of a fourth basin) are identified in Bulletin No. 118 for the Santa Margarita River Watershed including Basin No. 9-5 (Temecula Valley) located in the Murrieta-Temecula Groundwater Basin. Basin No. 9-5 generally corresponds to the groundwater basin upstream of the Gorge as specified in CWRMA and the Murrieta-Temecula Groundwater Basin as defined in the *Fallbrook Case*.

SBX7 6 establishes a procedure for a Monitoring Entity to coordinate the monitoring activities for a basin and on September 24, 2012, DWR notified the District that Rancho California Water District is designated as the Monitoring Entity for Basin No. 9-5. The District developed the CASGEM monitoring plan for Basin No. 9-5 in consultation with the TAC. Additional information for the CASGEM program, the approved monitoring plan, and groundwater monitoring data posted for Basin No. 9-5 can be found at the following website: <http://www.water.ca.gov/groundwater/casgem/>.

7.2 Sustainable Groundwater Management Act

On September 16, 2014, Governor Brown signed the California Sustainable Groundwater Management Act (Act or SGMA) that was established as part of a comprehensive three-bill package that includes AB 1739 (Dickinson), SB 1168 (Pavley), and SB 1319 (Pavley) to provide the framework for statewide groundwater management by local authorities. The state agencies charged with administration of the Act are both the Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB).

The Act pertains to all groundwater basins identified and defined in DWR Bulletin 118. However, the Act includes an exemption for adjudicated basins as provided in §10720.8(a) that specifically lists the Santa Margarita River Watershed as an exempted adjudicated area. Thus, the four Bulletin 118 basins located within the Watershed are not subject to the general requirements of the Act. However, as specified in §10720.8(f), the Watermaster must comply with certain requirements under the Act, including reporting to DWR commencing on or before April 1, 2016.

As part of these reporting requirements, the Watermaster will submit to DWR copies of the Annual Watermaster Report and the Annual CWRMA Report to provide information for the Temecula Valley Basin (DWR Bulletin No. 118 Basin No. 9-5). In addition, the groundwater monitoring data for Basin 9-5 posted under the CASGEM Program fulfills a portion of the reporting requirements specified in §10720.8(f)(3)(A).